

CLAIMS

1. An engineered fibre reinforced cement product including a first major surface to which a carbonation reducing sealer is applied and a second generally opposing major surface to which a carbonation reducing sealer is applied, so as to reduce propensity for differential carbonation in 5 the product.
2. A product according to claim 1, wherein a carbonation reducing sealer is applied to substantially all surfaces of the product.
3. A product according to claim 1 or claim 2, wherein the carbonation reducing sealer applied to at least one of said first and second major surfaces is a radiation curable sealer.
- 10 4. A product according to claim 3, wherein the sealer applied to at least one of said first and second major surfaces is curable by a form of radiation selected from the group comprising: UV, infrared or near infrared; RF, microwave; gamma, and electron beam radiation.
5. A product according to any one of the preceding claims, wherein the sealer applied to at least one of said first and second major surfaces is thermally, air or chemically curable.
- 15 6. A product according to any one of the preceding claims, wherein the sealer applied to at least one of said first and second major surfaces is composed substantially of a formulation selected from the group comprising: acrylics; epoxy acrylates, and urethane acrylate sealers.
7. A product according to any one of the preceding claims, wherein the sealer applied to at least one of said first and second major surfaces includes an integral adhesion promoting 20 formulation.
8. A product according to any one of the preceding claims, wherein the sealers applied to said first and second major surfaces are composed of substantially the same formulation.
9. A product according to any one of claims 1 to 7, wherein the sealers applied to said first and second major surfaces are composed of substantially different formulations.

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10. A product according to any one of the preceding claims, wherein the sealer applied to at least one of said first and second major surfaces includes an adhesive formulation adapted to enhance bonding of a topcoat.
11. A product according to any one of the preceding claims, wherein the sealer applied to at least one of said first and second major surfaces is covered by a separate keycoat adapted to enhance bonding of a topcoat.
12. A product according to any one of the preceding claims, wherein the sealer applied to each of the major surfaces is at least 15 microns in overall thickness.
13. A product according to any one of the preceding claims, wherein the sealer applied to each of the major surfaces is between 15 microns and around 80 microns in overall thickness.
14. A product according to any one of the preceding claims, wherein the carbonation reducing sealer applied to each of the major surfaces is between 15 microns and around 50 microns in overall thickness.
15. A product according to any one of the preceding claims, wherein the sealer applied to at least one of said first and second major surfaces is applied in multiple coats or stages.
16. A product according to any one of the preceding claims, wherein the sealer applied to at least one of said first and second major surfaces is cured in multiple stages.
17. A product according to claim 16, wherein a keycoat is applied over the sealer on at least one of the major surfaces following partial curing and prior to full curing of the sealer, to enhance bonding between the sealer and the keycoat.
18. A product according to claim 16 or claim 17, wherein a topcoat is applied over the sealer on at least one of the major surfaces following partial curing and prior to full curing of the sealer, to enhance bonding between the sealer and the topcoat.

19. A product according to any one of the preceding claims, wherein the carbonation reducing sealer is substantially alkali resistant.

20. A product according to any one of the preceding claims, wherein the carbonation reducing sealer is sufficiently cross-linked to impede migration of carbon dioxide through the 5 sealer to a predetermined extent.

21. A product according to any one of the preceding claims, wherein the carbonation reducing sealer is substantially flexible in a cured state.

22. A product according to any one of the preceding claims, wherein one or more of the chemical composition of the formulation, the method of manufacture, and the physical structure 10 of the cured product, are selected to reduce propensity for carbonation in the product.

23. A product according to claim 22, wherein the formulation has a cement to silica ratio of between 0.2 and around 1.5 on a dry weight basis.

24. A product according to claim 22, wherein the formulation has a cement to silica ratio of between 0.3 and around 0.9 on a dry weight basis.

15 25. A product according to claim 22, wherein the formulation has a cement to silica ratio of between 0.3 and around 0.5 on a dry weight basis.

26. A product according to claim 22, wherein the cement to silica ratio is between 0.36 and around 0.43 on a dry weight basis.

27. A product according to claim 22, wherein the cement to silica ratio is around 0.39 on a 20 dry weight basis.

28. A product according to any one of claims 22 to 27, formed with a porosity of between 30% and around 40%.

29. A product according to any one of claims 22 to 28, having a porosity of between 30% and around 60%.

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30. A product according to any one of claims 22 to 28, having a porosity of between 35% and around 45%.

31. A product according to any one of claims 22 to 30, having a relative density of between 0.5 and around 2.0

5 32. A product according to any one of claims 22 to 31, having a relative density of between 0.8 and around 1.9.

33. A product according to any one of claims 1 to 32, being formed using a Hatschek process.

34. A product according to any one of claims 1 to 32, being formed by extrusion.

10 35. A product according to any one of the preceding claims, being a fibre reinforced cement sheet product configured for use as an exterior cladding panel.

36. A product according to claim 35, wherein the sheet product is substantially rectangular in shape, and wherein the carbonation reducing sealer is applied to all six sides.

15 37. A product according to claim 35 or claim 36, wherein the first major surface of the sheet product is a mounting surface adapted for inward orientation toward a substrate and the second major surface of the sheet product is an exposed surface adapted for outward orientation.

38. A method of manufacturing a durable fibre reinforced cement product, said method comprising steps of:

(a) mixing a wet fibre reinforced cement formulation;

20 (b) forming from said formulation a green product defining first and second generally opposing major surfaces;

(c) curing the green product to form a cured product; and

(d) applying a carbonation reducing sealer to said first and second major surfaces, so as to reduce propensity for differential carbonation in the product.

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39. A method according to claim 38, wherein the carbonation reducing sealer is applied to substantially all surfaces of the product.

40. A method according to claim 38 or claim 39, wherein the carbonation reducing sealer applied to at least one of said first and second major surfaces is a radiation curable sealer.

5 41. A method according to claim 40, wherein the sealer applied to at least one of said first and second major surfaces is curable by a form of radiation selected from the group comprising: UV, infrared or near infrared; RF, microwave; gamma and electron beam radiation.

42. A method according to any one claims 38 to 41, wherein the sealer applied to at least one of said first and second major surfaces is thermally, air or chemically curable.

10 43. A method according to any one of claims 38 to 42, wherein the sealer applied to at least one of said first and second major surfaces is selected from the group comprising: acrylics; epoxy acrylates, and urethane acrylate sealers.

44. A method according to any one of claims 38 to 43, wherein the sealer applied to at least one of said first and second major surfaces includes an integral adhesion promoting composition.

15 45. A method according to any one of claims 38 to 44, wherein the sealers applied to said first and second major surfaces are composed of substantially the same formulation.

46. A method according to any one of claims 38 to 44, wherein the sealers applied to said first and second major surfaces are composed of substantially different formulations.

20 47. A method according to any one of claims 38 to 46, wherein the curing step is performed using a process selected from the group comprising: autoclave, air and steam curing.

48. A method according to any one of claims 38 to 47, wherein the product is a sheet product configured for use as an exterior cladding panel.

49. A method according to claim 48, wherein the sheet product is substantially rectangular in shape, and wherein the carbonation reducing sealer is applied to all six sides.

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50. A method according to claim 48 or claim 49, wherein the first major surface of the sheet product is a mounting surface adapted for inward orientation toward a substrate and the second major surface of the sheet product is an exposed surface adapted for outward orientation.

51. A method according to claim 50, wherein the substrate is a supporting frame.

52. A method according to any one claims 38 to 51, wherein one or more of the chemical composition of the formulation, method of manufacture, and physical structure of the cured product, are selected to reduce propensity for carbonation in the product.

53. A method according to claim 52, including the further step of compressing said green product prior to curing in a controlled manner such that the cured product exhibits a reduced 10 carbonation gradient.

54. A method according to any one of claims 50 to 53, wherein the cured product has a porosity of between 30% and around 60%.

55. A method according to claim 54, wherein the cured product has a porosity of between 35% and around 45%.

56. A method according to any one of claims 50 to 55, wherein the cured product has a relative density of between 0.5 and around 2.0.

57. A method according to claim 56, wherein the cured product has a relative density of between 0.8 and around 1.9.

58. A method according to any one of claims 50 to 57, wherein said wet fibre reinforced 20 cement formulation has a cement to silica ratio of between 0.2 and around 1.5 on a dry weight basis.

59. A method according to claim 58, wherein said wet fibre reinforced cement formulation has a cement to silica ratio of between 0.3 and around 0.9 on a dry weight basis.

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60. A method according to claim 58, wherein said wet fibre reinforced cement formulation has a cement to silica ratio of between 0.3 and around 0.5 on a dry weight basis.

61. A method according to claim 58, wherein the cement to silica ratio is between 0.36 and around 0.43 on a dry weight basis.

5 62. A method according to claim 58, wherein the cement to silica ratio is around 0.39 on a dry weight basis.

63. A method according to any one of claims 38 to 62, wherein the carbonation reducing sealer applied to each of the major surfaces is at least 15 microns in overall thickness.

10 64. A method according to claim 63, wherein the carbonation reducing sealer applied to each of the major surfaces is between 15 microns and around 50 microns in overall thickness.

65. A method according to any one of claims 38 to 64, wherein the carbonation reducing sealer is applied in multiple coats or stages.

66. A method according to any one of claims 38 to 65, wherein the carbonation reducing sealer is substantially alkali resistant.

15 67. A method according to any one of claims 38 to 66, wherein the carbonation reducing sealer is sufficiently cross-linked to impede migration of carbon dioxide through the coating to a predetermined extent.

68. A method according to any one of claims 38 to 67, wherein the carbonation reducing sealer is substantially flexible in a cured state.

20 69. A method according to any one of claims 38 to 68, wherein the carbonation reducing sealer applied to at least one of the major surfaces is cured in multiple stages.

70. A method according to claim 69, including the further step of applying a keycoat over the sealer following partial curing and prior to full curing, to enhance bonding between the sealer and the keycoat.

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71. A method according to claim 69 or claim 70, including the further step of applying a topcoat over the sealer following partial curing and prior to full curing, to enhance bonding between the sealer and the topcoat.

72. An engineered fibre reinforced cement product including a first major surface with a 5 reduced propensity to differential carbonation, wherein the product has a cement to silica ratio of between 0.29 and around 0.51 and a porosity of between 25% and around 45%.

73. A product according to claim 72, including a major surface to which a carbonation reducing sealer is applied.

74. A product according to claim 73, wherein a carbonation reducing sealer is applied to 10 substantially all surfaces of the product.

75. A product according to claim 73 or claim 74, wherein the carbonation reducing sealer is a radiation curable sealer.